Controlling Listeria Monocytogenes in Small and Very Small Meat and Poultry Plants

September 2001

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Background

In recent years, serious outbreaks of listeriosis have occurred in many types of meat and dairy products. Soft ripened cheese and underpasteurized milk have been causes of several cases, but recently, ready-to-eat (RTE) meat and poultry products have caused hundreds of illnesses and dozens of deaths. Efforts to prevent contamination of meat products with *Listeria monocytogenes* must be conducted at all levels of production. This is a difficult task given the fact that *L. monocytogenes* is so widespread in the environment. This booklet is designed to provide guidelines to the small and very small processor on practices and methods to assess, prevent and control the opportunities for contamination of RTE products by *L. monocytogenes.*

Introduction

Listeriosis is a disease caused by a species of bacteria called *Listeria monocytogenes (Lm)*. *Lm* is widely spread throughout the environment. It has been isolated from soil, water, silage, and many other environmental sources. *Lm* is found in at least 37 species of mammals, both domestic and wild, as well as up to 10% of humans may be intestinal carriers. It has been found in 17 species of birds and some species of fish and shellfish. *Lm* is very hardy**.** It is more heat resistant than most foodborne bacterial pathogens and also can survive freezing and drying. *Lm* resists high salt levels, nitrite, and acid. It can grow in vacuum packaged products.

L. monocytogenes is especially pathogenic to high risk populations, including newborns, pregnant women, elderly, and people with weakened immune systems, such as persons immuno-compromised by corticosteroids, anticancer drugs, graft suppression therapy and AIDS. Other conditions that may increase susceptibility to listeriosis are diabetes, cirrhosis, asthma, and ulcerative colitis. Healthy people are at generally low risk, however, if the food is heavily contaminated, any person is susceptible.

Some research suggests that use of antacids or cimetidine may increase the risk of contracting listeriosis. Although listeriosis is relatively uncommon, it is a potentially fatal disease. It frequently results in abortions in pregnant women. Even though the symptoms may be relatively mild in the mother, the illness may be transferred to the fetus causing serious illness or fetal death. Some symptoms of *L. monocytogenes* may include meningitis, encephalitis, septicemia, spontaneous abortion, still birth, and influenza-like symptoms.

The onset is anywhere from a few days up to six weeks after ingestion with the symptoms lasting from a few days to several weeks. Listeriosis is clinically defined when the organism is isolated from blood, cerebrospinal fluid, or an otherwise normally sterile site (e.g. placenta). Because of the widespread nature of the organism, it is important in a food processing operation to make every effort to prevent contamination from *L. monocytogenes* and prevent recontamination in foods that are ready-to-eat (RTE) finished products. The latest figure from the Center for Disease Control indicate that there have been as many as 2,500 cases of *L. monocytogenes* and as many as 495 deaths each year. The infectious dose has not been established at this time. Due to the increase in foodborne illness associated with *L. monocytogenes* in meat and poultry products, the USDA has issued a zero tolerance policy for the organism in RTE foods. As a result, a large number of recalls have occurred since 1998. Since *Lm* is widely found in the environment and livestock, it is not surprising that it is frequently found in vegetables and uncooked meat.

Today, a major food safety concern is that of contamination after thermal processing. Some examples where post-processing contamination has occurred and caused major outbreaks include hot dogs and luncheon meats. In 1998, one of the largest outbreaks of *Lm* occurred with a large manufacturer of hot dogs resulting in 15 adult deaths, 6 stillbirths and over one million pounds of product recalled. Effectively controlling *Lm* is challenging and requires intensive management and resources. Even though the risk of listeriosis is relatively low, the consequences are devastating for both the consumer and the processor. Lm is often present in raw ingredients. Because Lm is heat resistant, adequate cooking is

important to assure destruction of the organism.

Employee training is another step in controlling the problem. Employees must understand the organism, basic sanitation principles and gain the same sense of personal responsibility that management and regulatory officials adopt.

The FSIS HACCP regulations direct plants that produce ready-to-eat products to address control measures for *Lm* in their HACCP plan. FSIS has provided guidance to the industry on practices that have been successful in meat and poultry operations to prevent the spread of *L. monocytogenes* in ready-to-eat meat. FSIS also proposed guidelines for testing, either by the plant or by FSIS inspectors. Testing for *L. monocytogenes* in the last two years has shown that that the incidence is relatively high in many RTE products.

Table 1. **FSIS RTE Sampling Programs, 1998 to 2001**

Product category	**% positive for L. monocytogenes**
sliced ham/ luncheon meats	5.7%
small diameter sausages	4.4%
salads and spreads	3.4%
roast, corned, cooked beef	3.1%
uncured cooked poultry	2.4%
large diameter sausages	1.6%
jerky	0.7%

Programs for Prevention and Control of *Listeria*

Plants must focus on preventing contamination of ready-to-eat products with *L. monocytogenes*. *Lm* contamination of cooked meat products most frequently occurs when a product or food contact surface is contaminated between the cooking step and packaging (e.g. during slicing or peeling operations. However, there may be other sources whereby the organism is introduced into the processing area.

Lm also can be introduced from employees, equipment, animals, environmental reservoirs or ingredients. Prerequisite programs such as Sanitation Standard Operating Procedures (SSOPs) are critical in controlling *L. monocytogenes* in the processing establishment. *Lm* can grow in cool, damp environments such as those found in any process area, coolers, or on

slaughter floors. Incomplete removal of meat and fat from processing equipment and improper sanitation can allow biofilms to develop. These provide nutrients and a place of attachment for allowing the growth of bacteria, including *Lm*.

Those products that have been fully cooked prior to final packaging and will be consumed as packaged, without further heat treatment, present the highest risk to consumers if contaminated with *Lm*. Control of the process requires assessing the product flow and identifying the most likely sites of contamination. To gain a perspective on where product may become contaminated after processing, review tables 2, 3, 4 and 5. A pre-processing checklist has been developed to help the processor evaluate areas of high risk (see Appendix A).

Table 2. **Potential Product Sources of *L. monocytogenes*** (in-plant)

- Raw product and ingredients (meat and poultry)
- Solutions to chill foods (e.g. brine solutions)
- Loose product
- Rework
- Returned Product

Table 3. **Possible Post-cooking Product Contact Surface Areas Contaminated with *L. monocytogenes***

Slicers, dicers
Saws
Casing peelers
Shelves and racks
Lugs, tubs and containers
Hand tools, gloves, and aprons
Packaging materials
Packaging equipment
Tables
Conveyors, belts
Sponges and brushes for cleaning

In addition to contact areas, many opportunities exist for contamination from the environment. Some areas may harbor the organism which, under certain conditions, may lead to the contamination of product contact areas. For, instance, hose spray may splash or atomize and carry *Lm* from floors or drains on to tables or equipment.

Disruptions in the production process or environment tend to be associated with contamination events. In particular, disruptive construction (e.g., breaking out walls or other activities that can generate dust) has been shown to have a clear association with Listeria spp. contamination of both product and the surrounding environment. Dust from construction and other disruptive activities can establish contamination on food contact and other environmental surfaces that can be difficult to detect and control. Therefore, increased testing of product food contact surfaces and the remaining environment is recommended during and after these disruptive events have occurred.

Table 4. **Potential Reservoirs of *L. monocytogenes* in Small and Very Small Plants**

Floors and drains
Standing water (e.g. condensation drip pans)
Ceilings and overhead pipes
Refrigeration condensation units
Wet insulation (exposed to processing area)
Cleaning tools (sponges, brushes, squeegees)
Overhead rails and trolleys
Maintenance tools (wrenches, screwdrivers)
Wooden pallets
Fork lifts/pallet jacks

Understanding where sources of potential contamination exist is very important to producing a safe RTE product, as most outbreaks and recalls are due to post-processing contamination.
In general, once proper cooking has occurred, the burden for producing a safe product depends on proper sanitation, limited handling**,** elimination of cross-contamination and minimizing adverse time/temperature effects in all phases of handling and transportation.

Table 5**. Other Areas Where *L. monocytogenes* May be Hidden**

Any recess or hollow material: rollers, switch boxes, box cutters, motor housings
Rusted materials: equipment frames, pipes, shelving
Cracked or pitted rubber hoses, door seals
Walls that are cracked, pitted, or covered with inadequately sealed surface panels
Vacuum/air pressure pumps, lines, and hoses

Ice makers
Air filters
Open bearings

Processors of RTE products should ask three questions for determining the risk of exposure of their product to *Listeria monocytogenes*:

1.) Do validation results support the efficacy of kill steps used in your processing?

2.) If your products are exposed to an environment not known to be free of L. *monocytogene*s, what post-processing steps **can** prevent contamination in that environment?

3.) What does the finished product testing tell you about the status of your products with respect to *L. monocytogenes* contamination?

Do you produce products that will support the growth of *L. monocytogenes?* Products that **would not be considered capable of** supporting the growth of *L. monocytogenes* must have at least one of the following characteristics:

a. Water activity (A_w) value of less than .92.
b. pH less than 4.39 when measured at 75^0 F**,**
c. : (Aw of .85 and pH of 4.6 are often used to describe shelf stable products but are not the limits for Lm growth)
d. Food is in an unopened, sealed container that is commercially sterile under non-refrigerated storage (retorted or aseptically filled),
e. Laboratory evidence demonstrates that no growth Lm can occur, or
f. The product does not support the growth of any microorganisms.

L. monocytogenes is relatively heat resistant but killed by adequate thermal processing. Much of the focus on control of *Listeria monocytogenes* is in the prevention of recontamination after cooking. It remains important to validate that all thermal processes and procedures will meet the requirements for pathogen destruction.

Listeria monocytogenes Control Methods

There are many considerations for controlling *L. monocytogenes* in RTE products. Some of these include:

Prevalence of contamination in raw ingredients: One third of raw, commercially available ground chicken and turkey and about 10% of broiler carcasses, cow and bull carcasses, and raw ground beef harbor *Lm*. Four to seven percent of turkey carcasses, hog carcasses, and steer and heifer carcasses have been found to harbor *Lm*. Given this high prevalence of contamination in raw products, it is important to have processes that will eliminate the organism.

Sanitation: Sanitation is critical for ensuring that RTE products do not become recontaminated. SSOPs should be established to provide effective and consistent results. Effective sanitation includes the following steps.
a) dry cleaning, b) pre-rinsing equipment, c) foaming and scrubbing, d) rinsing, e) visual inspection of equipment, f) cleaning walls and floors, g) sanitizing, and h) drying *(drying is important to reduce the opportunity for listeria to grow on floors - this organism needs moisture to grow! Floors should be kept drained of standing water and as dry as possible)*
The effectiveness of sanitation and the discovery of potential sources of contamination should be established by conducting baseline microbial testing of both environmental and contact surfaces. Tests include ones for Aerobic Plate Count (APC), ATP tests such as the 'Lightning' test, or tests for *Listeria* spp. These can all be used to gain information about cleaning and sanitation procedures.
Frequency of sanitation will be determined, to some extent, by the type of products and the risk involved. (See Table 6)
Equipment and tools dedicated for use with RTE products only should be sanitized before and after use. Do not clean equipment parts on the floor. Use equipment that is clean and sanitized. Pay close attention to difficult-to-clean places where bacteria may easily hide.

Sanitizers that have proven most effective against *Lm* are quaternary ammonia compounds (quats), chlorine solutions and newer products containing peracetic acid. Rotating sanitizers

periodically is generally a good practice as it will provide more effectiveness against *Lm* and other bacteria. Rotating sanitizers for various applications, including boot dip stations for reentry into ready-to-eat areas is generally recommended. Alternating between alkaline-based detergents and acid-based detergents daily also helps to avoid "soapstone" or hard-water buildups and biofilms. Alternating detergents also helps change the pH regularly to prevent adaptation of bacteria to a particular environment. (Care must be taken to NOT use chlorine and acid-based detergents simultaneously due to potential chemical hazards to employees). Processors should work with suppliers of these products or sanitation professionals to develop a plan best suited for a particular operation.

- Care must be given when cleaning rooms used for storing equipment and products so as not to splash water from the floor onto the product, thus possibly contaminating it with bacteria.

Table 6. **Recommended Frequency For Cleaning and Sanitizing**

Area	Frequency
All Processing Equipment	Daily
Floors/Drains	Daily
Waste Containers	Daily
Storage Areas	Daily
Wall	Weekly
Condensate drip pans	Wkly/mthly
Coolers	Wkly/mthly
Freezers	Semiannually

Plant design: Many plants in operation today were not properly designed to prevent cross-contamination of processed meat products. Some considerations are:

- the storage of products, product flow and the movement of people between raw and RTE areas is very important. One of the first things that must be done is to eliminate traffic flow between RTE and raw areas; RTE products must not come into contact with or be in proximity of raw products.

- RTE areas should be equipped with dehumidifying cooling units and drip pans for handling condensation. These units should be directed away from products in these areas and sanitized regularly

- Ceiling, floors, and walls should be smooth, sealed, and moisture-free.

- Air supply should be filtered to prevent contaminants from entering the building or the room. Rooms storing RTE products should be under positive air

pressure so that air is not received from a non-filtered or raw product area.

- Light fixtures should be designed so as not to harbor dirt or moisture. Remove any difficult-to-clean overhead light fixtures from areas where RTE products are exposed.

- Make all efforts to eliminate condensation in ready-to-eat work areas and coolers. Regular cleaning and disinfection of condensation drip pans is important. Plumbing from these drip pans is a potential source of contamination when routed onto the floor.

In-Plant Sources of Contamination

The primary sources of contamination of *Lm* within the plant are: 1) employees, through their clothing, gloves, boots or coming into direct contact with the product. 2) improperly cleaned and sanitized equipment and, 3) the environment, either through airborne bacteria or aerosol moisture droplets generated from disturbances in work areas including disruptive construction projects, disassembly of equipment or other parts of the plant.

TESTING for *L. monocytogenes* or *Listeria spp.*

The purpose of conducting an environmental monitoring program is to identify any problem areas within the plant processing environment that may harbor *Listeria* and serve as a source of product contamination. Clearly identifying these areas allows cleanup and sanitation efforts to be refocused so that the potential sources of contamination are eliminated.

What does microbiological testing indicate about the status of RTE products with respect to microbial contamination? Regulators believe that positive tests for *L. monocytogenes* in finished RTE products is significant evidence that the organism may be a food safety hazard reasonably likely to occur in the production process for that particular product.

Listeria monocytogenes is the only *Listeria* species that is associated with foodborne illness. However, when environmental monitoring is conducted, we are interested in finding any type of *Listeria* (generic *Listeria* species). If a particular area of the plant environment is supporting one type of *Listeria*, it could just as easily serve as a reservoir for *Listeria monocytogenes.*

Sampling programs

Sampling sites and sampling frequency should be considered based on features of the plant, type of product, plant layout, and product flow. The other consideration is whether to test for *L. monocytogenes*, the specific pathogenic organism, or whether to test for *Listeria* species (spp.) which may or may not include *Listeria monocytogenes*. Specific locations for microbial tests may be required under regulatory mandates. Typically, processors consider three general locations for testing for *Listeria* spp*:* environmental (non-contact surfaces), equipment (food and non-food contact surfaces) and product.

Environmental testing (non-food contact surfaces). These tests would include sampling in the post-cook processing and packaging areas to discover where *Listeria* spp. might be found. This test would be used to evaluate effectiveness of existing sanitation programs and develop methods to improve them. Positive tests may indicate problems with airflow, people traffic patterns, or personnel hygiene (including handwashing, dirty frocks or aprons, improper movement between raw product areas and cooked product areas). Tested areas could include air handling units, vents, drip pans, packaging, floors (particularly drains), walls, ceilings, frocks, aprons or the air. Positive tests for either *L. monocytogenes* or *Listeria* spp. would indicate that the sanitation program has failed and additional attention must be paid to preventing the introduction of *Listeria spp.* into the RTE processing areas. Positive environmental tests would not trigger a product recall. Frequent positive tests should be of concern to the processor and would indicate that product testing should be conducted to ensure product safety.

Food Contact surface testing. These tests would include testing any equipment that would come into contact with the cooked, RTE product. These surfaces could be slicers, tables, peelers, and packaging equipment or hand tools such as knives. Testing could be for either *L. monocytogenes* or *Listeria* spp. A positive contact surface test for *L. monocytogenes* implies that the finished product has touched that area and may be contaminated with *Lm.*

Product testing Product testing is, arguably, the best method to determine if a *L. monocytogenes* or *Listeria* sp*p*. is present on the product. However, negative results can give a false sense of security since only the small area sampled may not find contamination in every case. While product testing is considered the best test for finding the presence of *Lm*, the entire lot of a tested product should be held until test results are received, which will be at least 48 hours. For many processors, it is not feasible to do this regularly due to a lack of storage space for finished product.

Proposed regulations require periodic testing to verify that the process controls for eliminating risks for *L. monocytogenes* are effective. Tests for *Listeria* spp. may be conducted in-house by an establishment, but these should be validated regularly by an outside laboratory. Plants should give serious considerations before conducting *L. monocytogenes* tests in-house due to possible further cross-contamination and further spread of the organism in the plant.

General Procedures for Sampling *Listeria*:

A responsible employee should be identified who is properly trained to conduct this testing. It is important to have the same employee conduct the testing on a regular basis to ensure consistency of the procedures.

Samples must always be taken in the same manner and be of the same size area sampled.

For large flat surfaces such as tables, equipment, floors, drip pans, etc., a 12-inch X 12-inch area is swabbed by rubbing the moistened sponge back and forth in parallel lines, then flipping the sponge and swabbing the same area in a perpendicular direction.

For drains, the drain cover should be removed then the interior surface and throat of the drain should be swabbed.

For small or confined spaces, (chain conveyor links, machine interiors, knife holders, etc.) swab several spaces or as large a total surface as possible.

Make sure the sponge bag is clearly marked with the sample date, company name and sample location.

Good records must be kept of exactly where the sample was taken.

If the sampled area is a food contact surface, it is advisable to sanitize the swabbed area immediately after sampling. By doing this, any questions are eliminated about the disposition of the product that touched that surface if the tests are positive for *Listeria.*

What to do if *Listeria* is discovered?

If *Listeria* is found, cleanup, sanitation and re-testing efforts should be intensified in that area to eliminate the source, demonstrate removal of contamination and keep it under control. After intensified cleaning and sanitization, additional testing of the area should be ongoing until it can be clearly shown that the contamination has been eliminated (e.g. at least two negative results for the contaminated site).

Implications for HACCP

1. Hazard Analysis:

Given the frequency of meat products positive for Listeria as shown in Table 1, there is an overwhelming scientific basis for recognizing that contamination of RTE meat products with *Listeria* is LIKELY TO OCCUR. This means that in all cases where the product is subject to *Listeria* contamination after thermal processing the hazard analysis must address the control of *Listeria*.

2. Critical Control Points (CCP)

For most RTE products, a CCP likely exists for thermal destruction of pathogens. This CCP, if adequate for heat resistant bacterial pathogens such as Salmonella and Lm**,** should remain as is. Another CCP will probably need to be developed to address the prevention of post-process contamination of the product. All plants have a regulatory requirement for HACCP and are already operating with a sanitation program called Sanitation Standard Operating Procedures (SSOPs). In many cases, all or part of an SSOP may be transferred to the actual HACCP plan as sanitation now becomes recognized as CRITICAL to the production of a safe meat product. There is no step later in the process which will control the hazard (see decision tree). The detail of this transfer will vary from plant to plant and even product to product based on the hazard analysis and the method the plant decides to use for control of that hazard. Some examples of CCPs developed from SSOPs might be:

- personal hygiene: using colored clothing such as blue frocks for RTE areas and white for raw product areas, hand washing, boot disinfection, and/or use of hair nets.
- recording the concentration of sanitizers and the application of these.
- use of tests such as "Lighting" to determine effectiveness of cleaning and sanitizing programs particularly during verification of the effectiveness of pre-operative sanitation.

3. Critical Limits (CL) and Records

Any Critical Control Point must have a Critical Limit that is observable and measurable. "Measurable" can be many things, from simply measuring the number of violations for a clothing policy to measuring the amount of sanitizer used in a given period of time or observing the sanitation person accurately measuring sanitizer.

4. Verification/Corrective Actions

Verification of sanitation procedures should be conducted periodically to ensure plant operators that the sanitation program is effective in preventing the presence of L. *monocytogenes* on either product contact areas, other environmental sites or in the final product. Microbial swab tests on either equipment or product should be used to verify that effectiveness (see discussion of testing procedures above) and to determine if any abnormal situations exist.

Positive tests for *L. monocytogenes* on either contact surfaces or in finished product will initiate Corrective Action (CA). The CA would likely start with testing of finished product to ensure that no contaminated product reaches the consumer. The next step would be to re-examine the sanitation program to determine how the contamination occurred. This may lead to re-evaluation of the Critical Limits and Record keeping procedures.

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Appendix A

Checklists for *Listeria* control

Controlling *L. monocytogenes* in facilities that produce RTE products can be accomplished through strict prevention principles.

The following series of questions is designed to help the small processor perform a risk assessment of *Listeria* contamination in their facility. These questions are quite specific to some processes and may not be applicable to all processors.

The processor may wish to choose the most critical of these for their operation and develop a list to be checked on a weekly or monthly basis.

Facility / product separation

Is the facility designed to prevent RTE employees from traveling through areas where raw product is processed or stored?

Can feasible modifications to the facility improve personnel traffic patterns?

Is the facility designed to keep RTE product separate from raw and not-fully-cooked product?

Can feasible modifications be made within the facility to separate raw and fully cooked product?

Is production scheduled to minimize the possibility of cross contamination from raw product and personnel?

Are raw materials being stored in separate areas from the finished product?

Are the facilities designed in such a manner to promote the highest degree of personnel hygiene?

Are facilities, locker rooms, lunchrooms, or walkways shared between RTE handlers and raw product handlers?

Does product ever incidentally contact walls?

Is there a footer at the base of walls to protect product from coming in contact with the walls?

Is there positive air pressure in the RTE area?

Is compressed air filtered?

What can be done to eliminate all condensation in the plant?

If eliminating condensation is not possible or feasible, what can be done to redirect or capture condensation?

Can product be redirected away from areas prone to condensation?

Are floors non-porous, cleaned and sanitized in manner sufficient to prevent contamination?

Sanitation/hygiene - Personnel

Are all employees trained in proper hygiene and the proper food handling procedures?

Is food safety incorporated into "On the Job" or "Hands On" training?

Does management set an example by utilizing proper food handling principles?

Can someone in the plant provide an unbiased evaluation of the performance of the SSOPs?

Do employees wash and sanitize their hands after touching any non-food item and before handling RTE product?

Can one employee be designated to handle "dirty" items such as handling trash, pallets, etc.?

Are there separate color-coded garments for RTE and raw personnel?

Do RTE handlers wear disposable gloves, aprons, sleeves, etc?

Do RTE handlers change disposable garments in a manner sufficient to prevent cross contamination from packaging materials, pallets, etc?

Do RTE handlers open products in a manner sufficient to prevent cross-contamination from the outside of the shipping container?

Are reusable packaging materials properly cleaned and sanitized before utilizing? (e.g. plastic buckets used for ham, chicken or turkey salad.)

Has the plant sanitation ever been audited by an outside source? (e.g. cleaning product supplier).

Sanitation/hygiene -Equipment and supplies

Are sanitizers approved for controlling *Listeria*?

Are sanitizers rotated regularly?

Are the packaging and RTE product storage areas cleaned and sanitized in a manner sufficient to prevent cross contamination?

Are packaging supplies kept in a sanitary manner before being utilized?

Are there floor, boot and wheel sanitizers located at key areas throughout the facility?

Are smoke trucks and racks high enough off the floor to prevent contamination from splash?

Do wheels have splashguards?

Is cooked product removed from cooler before cleaning?

Are rails, pipes, lines, ledges, lights, etc. cleaned and sanitized in manner sufficient to prevent overhead contamination?

Are cooling units designed in the most practicable manner to prevent overhead contamination?

Are cooling unit and drip pans cleaned and sanitized on a regular basis?

Is any certain area prone to condensation?

Are drains cleaned and sanitized in a manner sufficient to prevent contamination?

Do drains regularly clog and back flow on production floors?

Are strict precautions and sanitation measures in place in the event of an unforeseen hazard, such as drains backing up?

Is there standing water in any RTE areas? Can standing water be eliminated?

What precautions can be taken to avoid the creation of standing water?

Are walls cleaned and sanitized on a regular basis?

Are door handles, openers, switches and buttons cleaned and sanitized on a regular basis?

Is packaging equipment away from walls to provide ample room for complete sanitation of the walls and equipment?

Are non-product contact areas routinely cleaned and sanitized?

Are steam lines and shut off- valves free of leaks?

Do different sanitation crews clean the RTE and raw areas?

Are there separate cleaning supplies for RTE and raw areas?

Are cleaning supplies disposable?

Are non-disposable cleaning supplies heat pasteurized and stored in sanitizer?

Are disposable wipes used instead of rags?

Are squeegees used instead of mops?

Do brooms and brushes have plastic handles and bristles?

Are hoses cleaned and sanitized after each use?

Is cleaning equipment cleaned and sanitized in the same manner as processing equipment?

Equipment- sanitation

Are peelers completely disassembled, cleaned and sanitized after each use?

Are peeler blades disposed after each use?

Are link cutters completely disassembled , cleaned and sanitized after each use?

Are conveyors and belts completely disassembled , cleaned and sanitized after each use?

Are cutting boards, band saws, and slicers cleaned and sanitized after processing bacon, not fully cooked smoked pork loins, not fully cooked smoked hams and before processing RTE products?

Are hand tools cleaned and sanitized in manner sufficient to prevent contamination?

Are there separate tools, knives, lugs, tubs for RTE product, rework, etc.?

Are molds and dies cleaned and sanitized on a daily basis?

Is routine maintenance and internal sanitation performed on the packaging equipment?

Process Verification

Does the product support the growth of *L. monocytogenes*? (e.g.. pH in a fermented sausage, Moisture Activity in jerky)

Is the process validated with supporting scientific documentation?